

ANNUAL REPORT FOR 2003



**Gurley Mitigation Site
Greene County
Project No. 8.T340306
TIP No. R-1023WM**



Prepared By:
Office of Natural Environment & Roadside Environmental Unit
North Carolina Department of Transportation
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SUMMARY


The following report summarizes the monitoring and construction activities during 2003 at the Gurley Mitigation Site in Greene County. Originally constructed in 1997, the site provides compensatory wetland mitigation for several NCDOT projects in the Neuse River Basin. In June 2001, the site was delineated in order to verify that the site covered existing permit requirements. The Army Corps of Engineers approved the delineation in June 2001. The confirmed wetland delineation map that was produced from this exercise was included in the 2001 annual report.

The site is monitored with 16 groundwater-monitoring gauges, three surface water gauges, and one rain gauge. The hydrologic success criterion varies for each gauge, depending upon its location within the site. Per the request of the Corps of Engineers, the hydrologic monitoring requirements of the site were changed from the requirements stated in the approved mitigation plan. The riverine portion of the site must show saturation within 12" of the surface for 12.5% of the growing season, while the non-riverine areas must show saturation within 12 inches of the surface for at least 8% of the growing season. Vegetation planting occurred in four zones, with multiple plots in each.

Repairs were made to portions of the upland levee area in December 2003. The repairs were needed due to extensive washes along a portion of the levee adjacent to the beaver impoundment (See photo Appendix B). A gate will be added on the levee to prevent further public access.

Six non-riverine and two riverine gauges are located outside of the wetland extents based on the approved wetland delineation (2001). The results from these gauges are documented in Table 2, however the success of the site should not be influenced by the data reported for these gauges. Hydrologic monitoring in 2003 indicated that two riverine gauges recorded saturation within 12" of the surface for more than 12.5% of the growing season. Five non-riverine gauges recorded saturation for more than 8% of the growing season. Two riverine gauges and one non-riverine gauge that met the success criterion could not be downloaded due to high water from beaver activity. All three surface gauges indicated inundation throughout the growing season.

The success criteria for vegetation is that a minimum survival rate of 320 trees per acre is required after three years; this minimum requirement is reduced by 10% for two years following the third year of monitoring. Vegetation monitoring yielded an average tree density of 486 trees per acre, which is well above the minimum success criterion of 320 trees per acre.

The 2003-year represents the sixth consecutive monitoring season for vegetation and hydrology. Based on the sixth year of monitoring and the delineation approved by the Army Corps of Engineers (2001), NCDOT proposes that vegetation and hydrology monitoring be discontinued on the Gurley Mitigation Site. 

1.0 INTRODUCTION

1.1 Project Description

The Gurley Tract Mitigation Site is located in Greene County, approximately 12 miles northeast of Goldsboro (Figure 1). The site provides 170 acres of riverine and non-riverine restoration and enhancement. The Gurley Tract provides compensatory mitigation for several projects in the Neuse River Basin. The following plant communities are included in the site: Coastal Plain Bottomland Hardwood Swamp, Non-Riverine Wet Hardwood Forest, streambed Atlantic White Cedar Forest, and Cypress/Tupelo Swamp.

1.2 Purpose

In order to demonstrate successful mitigation, the site must achieve success for five consecutive years. Success criteria are based on federal guidelines for wetland mitigation. These guidelines stipulate criteria for both hydrologic conditions and vegetation survival. The following report describes the results of the hydrologic and vegetation monitoring during the 2003-growing season at the Gurley Tract Mitigation Site. Included in this report are analyses of both hydrologic and vegetative monitoring results, as well as local climate conditions throughout the growing season. Updated site photographs have also been provided.

Figure 1. Site Location Map



1.3 Project History

The site was initially monitored for both wetland hydrology and vegetation in 1998. Since then, additional work has been completed on the mitigation site. 2003 represents the sixth year of both hydrologic and vegetation monitoring; however it is the fifth year of monitoring following additional planting and remediation work in 1999.

December 1997	Site Constructed
January 1998	Site Planted
Spring 1998	Monitoring Gauges Installed
May - November 1998	Hydrologic Monitoring (1 yr.)
October 1998	Vegetation Monitoring (1 yr.)
February 1999	Zone 4 (Atlantic White Cedar Area) Planted
March - November 1999	Hydrologic Monitoring (2 yr.)
August 1999	Remediation on Nahunta Swamp Bank
September & October 1999	Vegetation Monitoring (2 yr.)
March - November 2000	Hydrologic Monitoring (3 yr.)
October 2000	Vegetation Monitoring (3 yr.)
March - November 2001	Hydrologic Monitoring (4 yr.)
June 2001	Wetland Delineation of Site
June 2001	Vegetation Monitoring (4 yr.)
August-September 2001	GPS Mapping of Beaver Impoundment
March – November 2002	Hydrologic Monitoring (5 yr.)
September 2002	Vegetation Monitoring (5 yr.)
March – November 2002	Hydrologic Monitoring (6 yr.)
September 2003	Vegetation Monitoring (6 yr.)

1.4 Debit Ledger

Table 1. Gurley Tract Mitigation Site Debit Ledger

Site Habitat	Mitigation Plan			Ratios	TIP Debit							
	Acres at Start	Acres Remaining	Percent Remaining		R-525 D	R-1023 AB B	B-3070	R-2001 B	R-2719 BA	R-525 G	U-3472	R-1030
SPH Restoration (RR)	26.92	4.84	17.98	1:5:1	1.48	12.66	1.19	4.68			2.07	
BLH Restoration (NRR)	27.83	-12.18	-43.77	2:01	1.08	34.58				3.76	0.59	
BLH Enhancement	26.92	-18.88	-70.13	4:01		45.8						
SPH Preservation	5.9	0	0.00	10:01			5.9					
Beaver Impoundment	20.61	20.61	100.00									
Total	87.57	-26.22	-29.94									

SPH: Swamp Hardwood

BLH: Bottomland Hardwood

RR: Riverine

NRR: Non-riverine

2.0 HYDROLOGY

2.1 Success Criteria

In accordance with federal guidelines for wetland mitigation, the success criteria for hydrology states that the area must be inundated or saturated (within 12 inches of the surface) by surface or ground water for at least a consecutive 12.5% of the growing season. Areas inundated less than 5% of the growing season are always classified as non-wetlands. Areas inundated between 5% and 12.5% of the growing season can be classified as wetlands depending upon factors such as the presence of hydrophytic vegetation and hydric soils.

Upon request of the US Army Corps of Engineers, the hydrologic monitoring requirements for the Gurley Tract Site have been altered from the original mitigation plan. The new success criteria state that the riverine portions of the site must be saturated within 12 inches of the surface for at least 12.5% of the growing season. The non-riverine areas must be saturated for at least 8% of the growing season. Monitoring will be conducted for a total of five years. The riverine and non-riverine portions of the site are illustrated in Figure 2; riverine areas are shaded on this map.

According to the Soil Conservation Service, the growing season in Greene County extends from March 17 to November 15, approximately 244 days. A consecutive 12.5% of the growing season for Gurley Tract would equal 30.5 days; a consecutive 8% would be equivalent to 19.5 days. Local climate must represent average conditions for the area in order for the hydrologic data to be valid.

2.2 Hydrologic Description

Sixteen groundwater, three surface water, and one rain gauge are used on the Gurley Tract to monitor site hydrology (Figure 2). The automatic monitoring gauges record the depth to the groundwater level. Daily groundwater and rainfall measurements were taken throughout the growing season; the surface water gauges record water levels every three hours.

Appendix A contains a plot of the water depth for each of the monitoring and surface gauges for 2003. Precipitation events, measured by the onsite rain gauge, are included on each graph as bars.

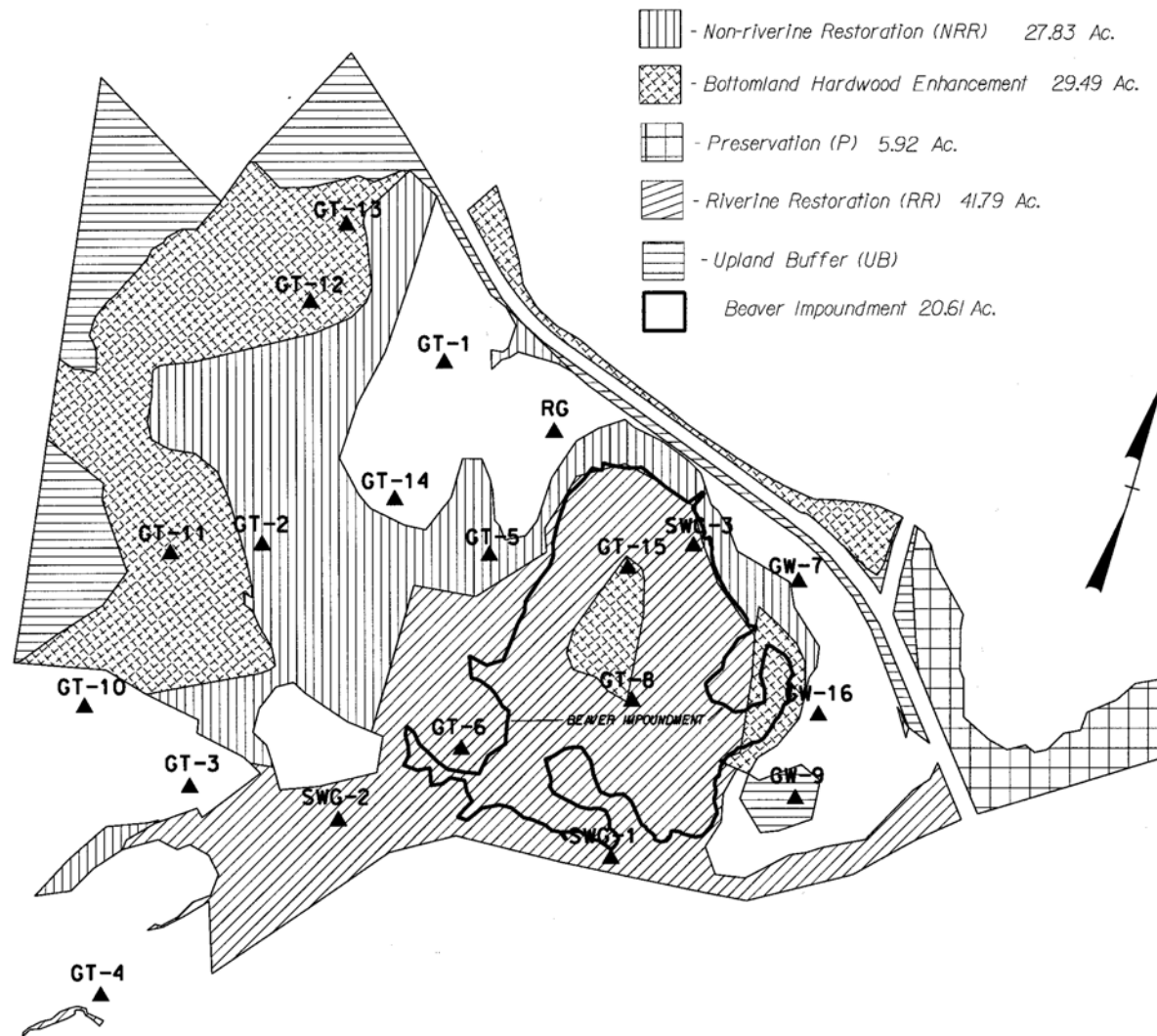


Figure 2. Monitoring Gauge Locations

2.3 Results of Hydrologic Monitoring

2.3.1 Site Data

The total number of consecutive days that the groundwater was within twelve inches of the surface was determined for each gauge. This number was converted into a percentage of the 244-day growing season. Table 2 presents the hydrologic results for 2003. Figure 3 is a graphical representation of the hydrologic monitoring results for 2003.

Table 2. 2003 Hydrologic Monitoring Results

Monitoring Gauge	< 5%	5-8%	8-12.5%	>12.5%	Actual %	Dates of Saturation
NON-RIVERINE (Success = saturation for 8% of the growing season)						
GW-1			×		8.2	Outside of Delineation
GW-2+				×	23.0	March 17-May 11
GW-3	×				0.4	Outside of Delineation
GW-5	×				2.5	
GW-7	×				1.6	Outside of Delineation
GW-9	×				0.8	Outside of Delineation
GW-10		×			7.0	Outside of Delineation
GW-11+				×	100	March 17-Nov 15
GW-12+				×	55.7	March 17-June 26 July 3-Nov 15
GW-13+				×	44.7	April 16-Aug 2
GW-15*				×	-	Standing water
GW-16	×				1.6	Outside of Delineation
RIVERINE (Success = saturation for 12.5% of the growing season)						
GW-4*				×	0.4	Outside of Delineation
GW-6+				×	29.5	March 17-May 27 Sept 12-Nov 15
GW-8*				×	-	Standing water
GW-14		×			7.4	Outside of Delineation

* Gauge could not be downloaded due to standing water at gauge location.

+ Gauge met during an average month of rainfall (March and May).

- Gauges that are highlighted in Table 2 are located outside of the Corps of Engineers approved wetland delineation.

- Gauges GW-8 and GW-15 could not be downloaded during the majority of the growing season due to standing water related to the beaver activity.

Table 3. Hydrologic Monitoring Results (1998-2002)

Monitoring Gauge	1998 % Results	1999 % Results	2000 % Results	2001 % Results	2002 % Results
NON-RIVERINE (Success = saturation for 8% of the growing season)					
GW-1	2.9	3.7	7.0	10.2	14.8
GW-2	8.7	1.2	7.9	8.6	4.9
GW-3	Not installed	0	0.8	1.6	0
GW-5	.8	0.4	12.8	2.5	15.2
GW-7	1.2	1.2	1.7	1.6	1.2
GW-9	0	0	0	0	0
GW-10	Not installed	Not installed	2.1	4.5	3.3
GW-11	2.5	30.3	24.0	23	28.7
GW-12	47.1	31.6	32.6	44.3	31.9
GW-13	47.1	34.4	47.9	67.2	22.1
GW-15	24.4	68.8	43	100	100
GW-16	Not installed	0.4	0	0.8	0.8
RIVERINE (Success = saturation for 12.5% of the growing season)					
GW-4	0	0	0	0	0
GW-6	18.2	14.3	52.5	100	33.2
GW-8	41.3	59.4	54.1	100	100
GW-14	Not installed	3.7	7.9	2.0	10.6
Climate Conditions	Average Rainfall	Not Available	Average Rainfall	Below Average Rainfall	Below Average Rainfall

Table 3 represents hydrologic data in percentages from the previous years (1998-2002).

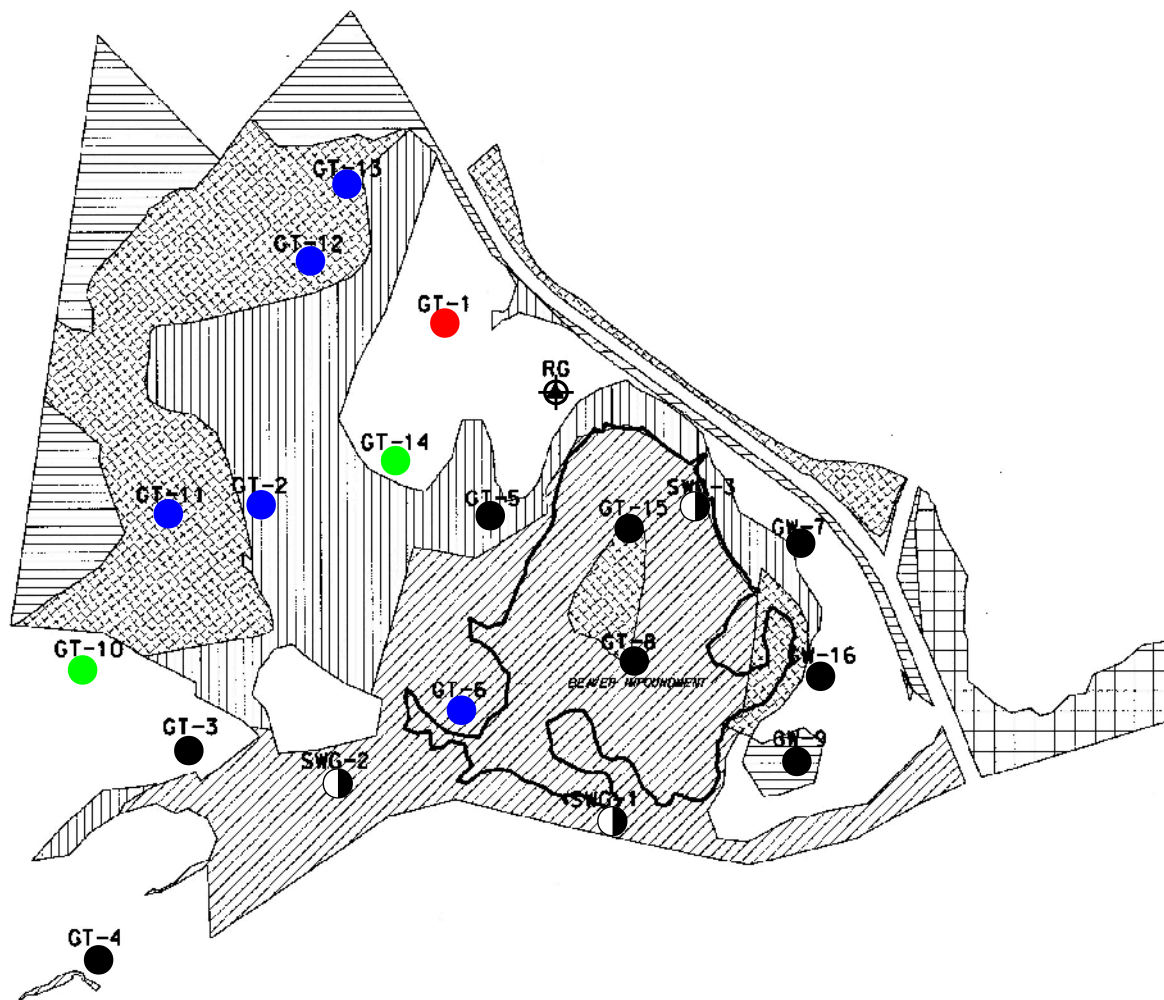


Figure 3. 2003 Hydrologic Monitoring Gauge Results

Hydrology Results

- < 5%
- 5 - 8%
- 8 - 12.5%
- > 12.5%

- ⊕ Rain Gauge
- ⊖ Surface Gauge

Not to Scale



2.3.2 Climatic Data

Figure 4 is a comparison of 2002-2003 monthly rainfall to historical precipitation for the area. The two lines represent the 30th and 70th percentiles of monthly precipitation for Goldsboro, NC. The bars are the monthly rainfall totals for 2002 and 2003. The NC State Climate Office provided the historical data.

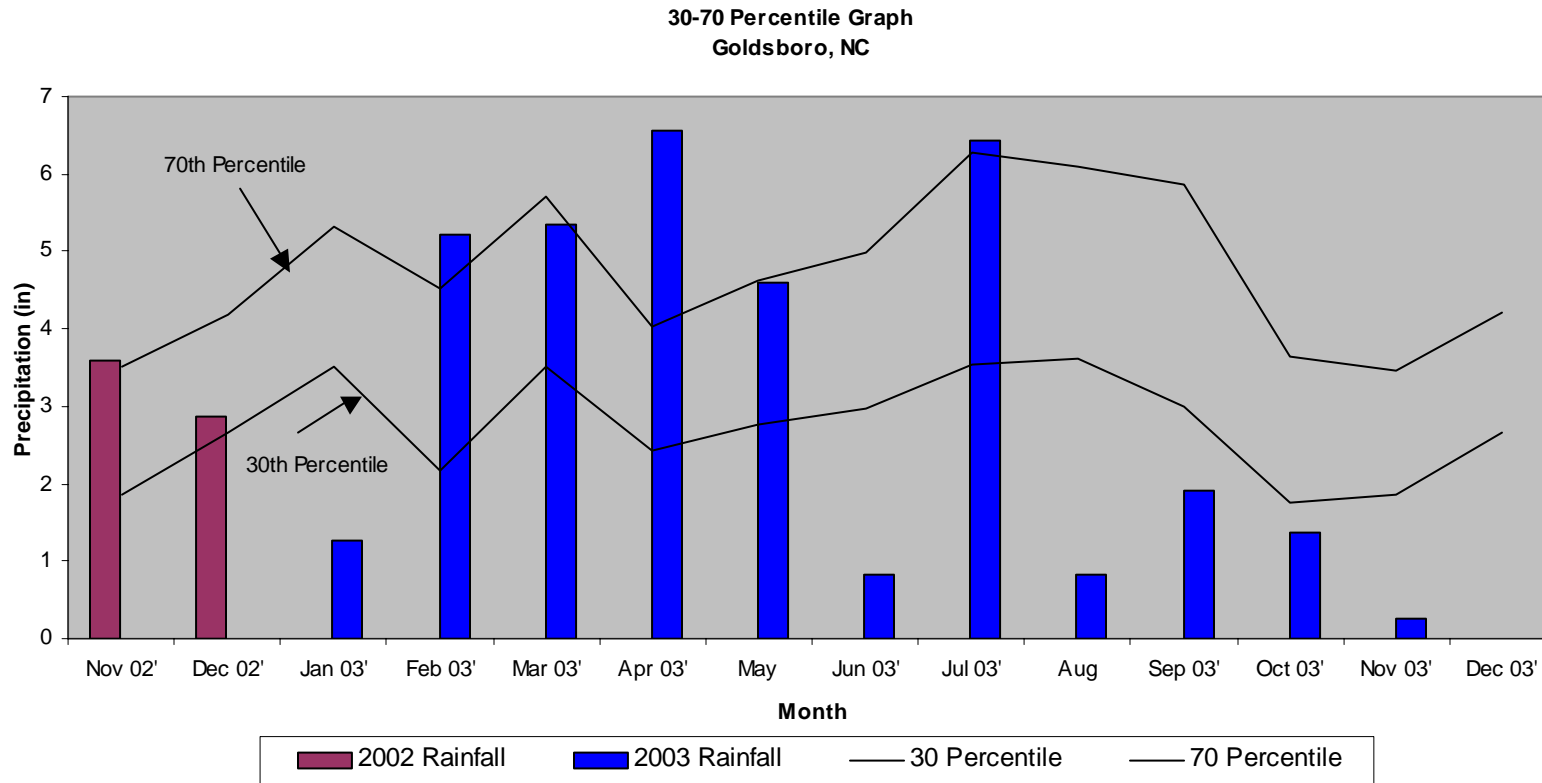
For the 2003-year, November (02'), February, April, and July experienced above average rainfall. The months of January, June, August, September, October, and November recorded below average rainfall for the site. December (02'), March, and May experienced average rainfall. Overall, 2003 experienced an average rainfall year.

2.4 CONCLUSIONS

Hydrologic monitoring in 2003 indicated that two riverine gauges recorded saturation within 12" of the surface for more than 12.5% of the growing season. Five non-riverine gauges recorded saturation for more than 8% of the growing season. Two riverine gauges and one non-riverine gauge that met the success criterion could not be downloaded due to high water from beaver activity. All three surface gauges indicated inundation throughout the growing season.

The 2003-year is the sixth consecutive year that hydrology has been monitored. Based on the monitoring data and the jurisdictional wetland delineation, NCDOT proposes to discontinue hydrology monitoring on the Gurley Mitigation Site.

Figure 4. 30-70 Percentile Graph, Goldsboro, NC



3.0 VEGETATION: GURLEY MITIGATION SITE (YEAR 6 MONITORING)

3.1 Success Criteria

The March 1998 Mitigation Plan states that there must be a minimum of 320 trees per acre living for at least three consecutive years.

Subsequent permit conditions associated with the site state that NCDOT will monitor the site for five years. The 320 stems per acre survival criterion for planted seedlings was used to determine success for the first three years. The required survival criterion was decreased by 10% per year after the third year of vegetation monitoring (i.e., for an expected 290 stems per acre for year 4 and 260 stems per acre for year 5).

3.2 Description of Species

The following tree species were planted in the Wetland Restoration Area:

Zone 1: Coastal Plain Bottom-Land Hardwood Forest (18.86 acres)

Taxodium distichum, Baldcypress
Fraxinus pennsylvanica, Green Ash
Quercus falcata var. *pagodaefolia*, Cherrybark Oak
Quercus michauxii, Swamp Chestnut Oak
Quercus phellos, Willow Oak
Quercus nigra, Water Oak
Nyssa aquatica, Water Tupelo
Quercus lyrata, Overcup Oak
Nyssa sylvatica var. *biflora*, Swamp Blackgum
Carpinus caroliniana, American Hornbeam

Zone 2: Non-Riverine Wet Hardwood Forest (17.57 acres)

Taxodium distichum, Baldcypress
Fraxinus pennsylvanica, Green Ash
Quercus falcata var. *pagodaefolia*, Cherrybark Oak
Quercus michauxii, Swamp Chestnut Oak
Quercus phellos, Willow Oak
Quercus nigra, Water Oak
Quercus alba, White Oak
Pinus serotina, Pond Pine
Platanus occidentalis, American Sycamore
Nyssa aquatica, Water Tupelo
Quercus lyrata, Overcup Oak
Liriodendron tulipifera, Tulip Poplar

Nyssa sylvatica var. *biflora*, Swamp Blackgum
Carpinus caroliniana, American Hornbeam

Zone 3: Streambank Levee Forest (3 acres)

Quercus michauxii, Swamp Chestnut Oak
Quercus alba, White Oak
Pinus serotina, Pond Pine
Platanus occidentalis, American Sycamore
Quercus lyrata, Overcup Oak
Salix nigra, Black Willow
Betula nigra, River Birch

Zone 4: Atlantic White Cedar Forest (7 Acres)

Planted February 1999*

Chamaecyparis thyoides, Atlantic White Cedar
Nyssa aquatica, Water Tupelo
Fraxinus pennsylvanica, Green Ash
Quercus falcata var. *pagodaefolia*, Cherrybark Oak
Nyssa sylvatica var. *biflora*, Swamp Blackgum

3.3 Results of Vegetation Monitoring

Table 4: Vegetation Monitoring Statistics

ZONE	Plot #	Baldcypress	Green Ash	Swp. Black Gum	Swp. Chestnut Oak	Water Oak	Willow Oak	Cherrybark Oak	Water Tupelo	Sycamore	Tulip Poplar	Pond Pine	White Oak	Atl. White Cedar	River Birch	Am. Hornbeam	Overcup Oak	Total (6 year)	Total (at planting)	Density (Trees/Acre)
1	2	11	1	3	7	2	6	10	10		4			1		3	1	59	63	637
	3	9			6	2	7	9	3	1							2	39	45	589
	T1	2	8		10	1	2		3		1				1			28	31	614
	T3	14			3													17	25	462
	T4		2					1										3	30	68
	T5	5	4				1		3						2			15	37	276
ZONE 1 AVERAGE DENSITY																				441
2	4	3	4		7	3	8	3			5	5	3	3			1	45	55	556
	5	1	3		6		5	4	5	7	4	2	1					38	52	497
	6	13	2	6	5		1	11			7	3				1	1	50	50	680
ZONE 2 AVERAGE DENSITY																				578
4	1		9						3					2				14	33	288
	T2	1	1	1	6		4	4	7					23				47	47	680
ZONE 4 AVERAGE DENSITY																				484
TOTAL AVERAGE DENSITY																				486

Zone 1: Other species noted: trumpet creeper, *Aster* sp., fennel, winged sumac, broomsedge, woolgrass, cane, blackberry, muscadine, plume grass, *Juncus* sp., *Baccharis* sp., river birch, red maple, briars, and sweetgum. 18-24 inches of standing water noted in plot T4, 8-16 inches of standing water noted in T5. Beaver activity evident in plot T4.

Zone 2: Other species noted: trumpet creeper, *Baccharis* sp., fennel, red maple, *Aster* sp., honeysuckle, holly, broomsedge, sicklepod, sweetgum, and pine.

Zone 3: Trees surviving along levee.

Zone 4: Other species noted: black willow, *Juncus* sp., smartweed, jewelweed, alder, cattails, and volunteer oaks.

3.4 Conclusions

Of the 426 acres on this site, approximately 46 acres involved tree planting. There were 6 test plots and 5 transects established throughout the planting areas. The 2003 vegetation monitoring of the planted areas revealed a total average density of 486 trees per acre. This average is well above the minimum requirement of 260 trees per acre.

NCDOT proposes to discontinue vegetation monitoring at the Gurley Mitigation Site.



OVERALL CONCLUSIONS/RECOMMENDATIONS

Monitoring activities in 2003 represent the sixth year of hydrologic monitoring at the Gurley Tract Mitigation Site. Hydrologic monitoring for 2003 indicated that two riverine gauges recorded saturation within 12" of the surface for more than 12.5% of the growing season. Five non-riverine gauges recorded saturation for more than 8% of the growing season. Two riverine gauges and one non-riverine gauge that met the success criterion could not be downloaded due to high water from beaver activity. All three surface gauges indicated inundation throughout the growing season

During the sixth year of vegetation monitoring, the site yielded an overall average survival rate of 486 trees per acre over four planting zones. This is well above the minimum requirement. NCDOT proposes to discontinue vegetation monitoring at the Gurley Mitigation Site.

The 2003-year represents the sixth consecutive monitoring season for hydrology and vegetation. Based on the monitoring data and the jurisdictional delineation (approved by the Army Corps of Engineers in 2001), NCDOT proposes that hydrology and vegetation monitoring be discontinued at the Gurley Mitigation Site.



APPENDIX A

GAUGE DATA GRAPHS

APPENDIX B

UPLAND LEVEE REPAIR PICTURE



APPENDIX C

SITE PHOTOS

Gurley



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6



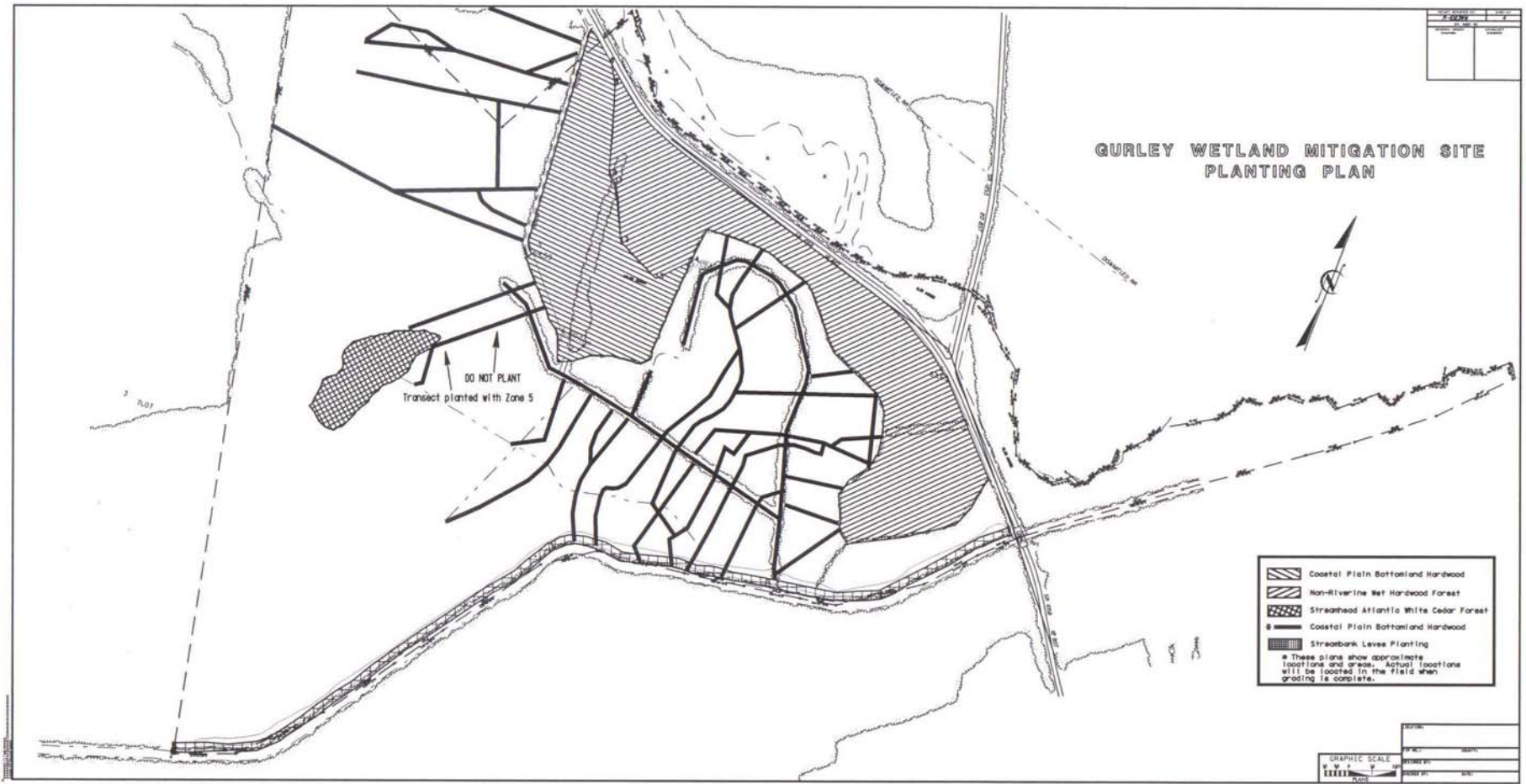
Photo 7



Photo 8

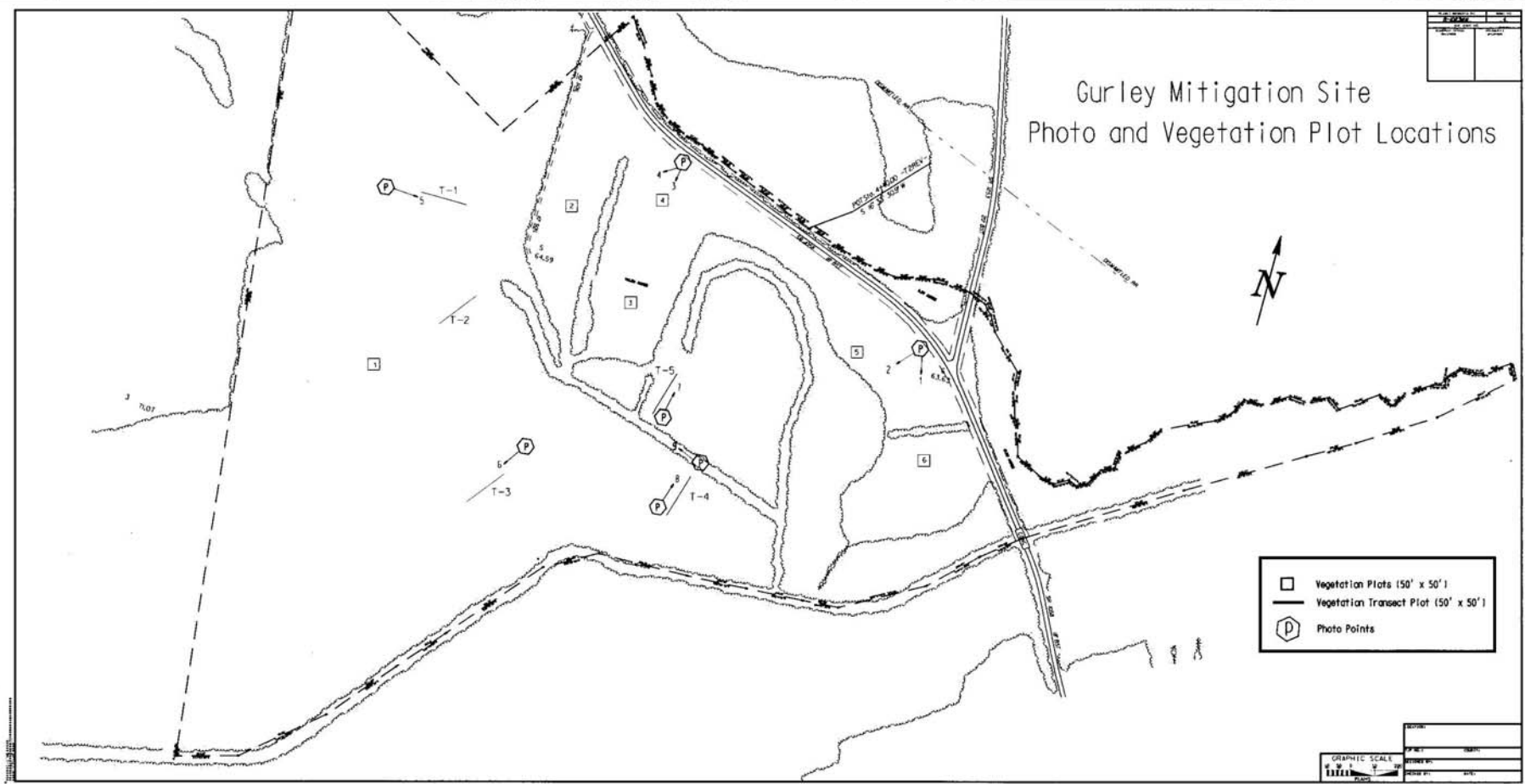


Photo 9



DATE	10/10/01
BY	W. J. GIBSON
PROJECT	WATERWAY RESTORATION
SHEET NO.	1
TOTAL SHEETS	1

Gurley Mitigation Site Photo and Vegetation Plot Locations



- Vegetation Plots (50' x 50')
- Vegetation Transect Plot (50' x 50')
- ⊙ Photo Points

GRAPHIC SCALE	1" = 100'
PROJECT	WATERWAY RESTORATION
SHEET NO.	1
TOTAL SHEETS	1